

Making Tapes and Wooden Rules

By Ethan Viall

The Lufkin Rule Co., Saginaw, Mich., manufactures a complete line of linen tapes, steel tapes and wooden or steel rules, in all their many forms. This article will describe some of the processes of the manufacture of linen rules and cases, and of wooden rules.

Some of the steps in the manufacture of the leather cases for linen or steel tapes are illustrated in Fig. 1. These various steps will be considered in detail.

BLANKING, ROLLING AND GLUING THE SIDES

The disks of leather used for the sides are cut from the hide by using sharp-edged rings, as shown in Fig. 2. These rings are used under the ram of a foot press, as shown, the leather being laid over a block of wood. Two of the cutting rings are shown at *A* and *B*, and some of the disks at *C*.

After the disks have been blanked out they are run between rolls, as shown in Fig. 3, to give them a uniform thickness. The next step is to coat the flesh side of the leather disks with glue, place disks of heavy brown paper on them and press into forming rings with plugs of the proper size.

A number of forming rings and plugs are shown in Fig. 4. After the disks have been pressed into these rings, they are dried in an oven at a low heat, for several hours, the result being a shallow, paper-lined, leather cup.

Details of the making of leather cases for tapes. How the tapes are made, graduated and numbered. The way wooden rules are divided and numbered. Some of the factory features.

PIERCING AND EMBOSSING

When dry, a hole is pierced in the center of each cup, the size of the hole depending for which half of the case the cup is intended. The cup to be pierced is centered under the punch by

over an engraved plate *C*; then pressure is applied, which forces the leather down into the sunken letters of the plate. A number of embossing plates are shown on the storage truck, Fig. 7. Some of the plates are made with raised letters and designs, which form correspondingly hollow designs in the leather.

TRIMMING

The edges are trimmed by pressing the cup over a faceplate of the proper size, against which it is held by means of a revolving tailplate operated by a hand lever, as shown in Fig. 8, and then cutting off the surplus with a back knife *A*. After the edge is trimmed, the holes for the sewing needles are marked in with a star wheel in a holder at *B*.

The next operation is to cut the hole

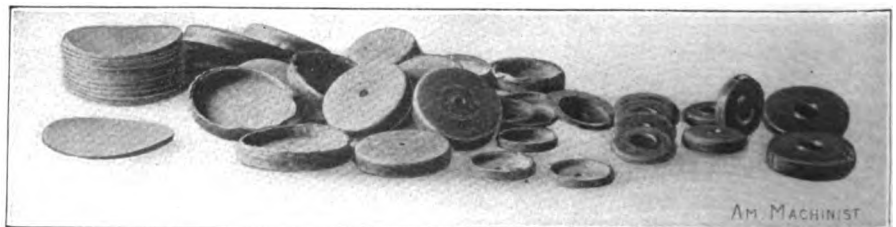


FIG. 1. STEPS IN THE PRODUCTION OF TAPE CASES

placing it in a locating cup over the die in a foot press, as shown in Fig. 5.

The embossing of the name or other lettering, is done in a hydraulic press, as shown in Fig. 6, the leather cup *A* with a plug *B* inside of it being placed

for the tape guide, through which the tape is drawn from the reel. This is done in the small press shown in Fig. 9, the rim of the half case being laid over the cutter *A*, and the wooden ram *B* brought down on it, cutting out a rec-

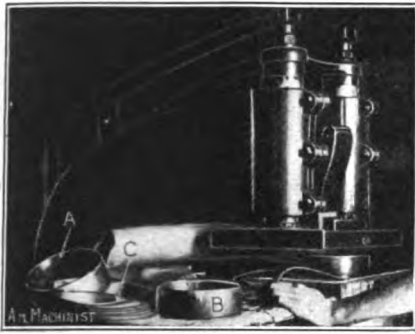


FIG. 2. CUTTING THE BLANKS

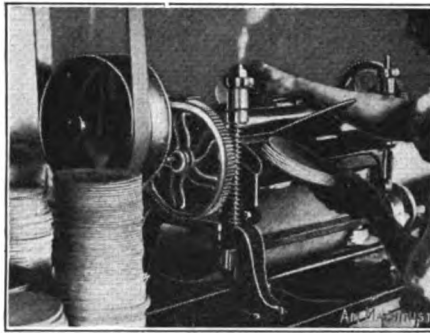


FIG. 3. ROLLING THE BLANKS

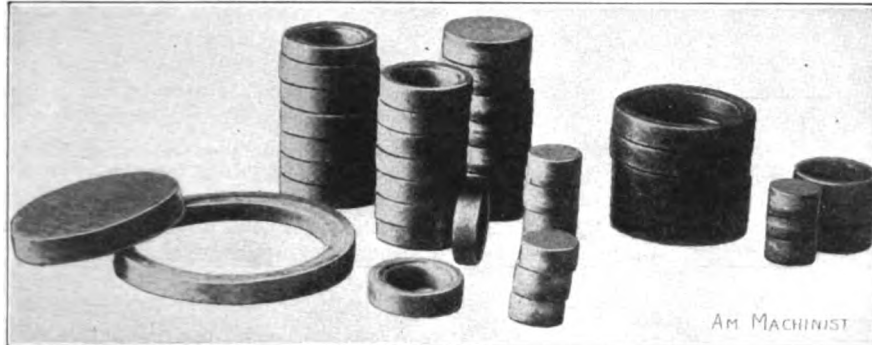


FIG. 4. THE FORMING RINGS AND PLUGS

tangular piece, as shown at C. The flanged rings are pressed in, and clinched in a small curling press. The halves are then ready to be sewed together, which is done by hand, the cases being held in a harness maker's vise, as shown in Fig. 10.

Next the tape guides are pressed into the rectangular hole in the edge of the case, and clinched in with a pair of specially formed pliers having a narrow jaw that goes inside the hole, and a wide one that fits the outside, as shown in Fig. 11. The cases are now ready to be varnished and dried, which is done by applying the varnish with a brush, as in Fig. 12, and then hanging the cases on pegs to dry.

MAKING TAPES

Owing to the difficulty of buying satisfactory tapes, the company has a large plant for spinning the thread and weaving the tapes. This installation will not be illustrated or described here, as it is simply a special branch of cloth making.

As the tape comes from the looms it is passed through a gas flame to singe



FIG. 7. TRUCK FULL OF EMBOSSING DIES

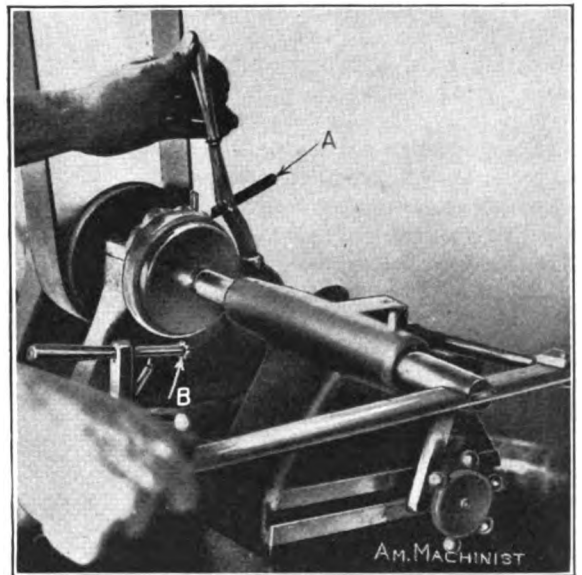


FIG. 8. TRIMMING AND NOTCHING

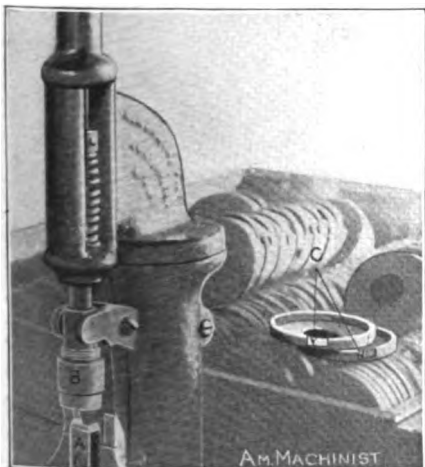


FIG. 9. CUTTING GUIDE HOLES



FIG. 10. SEWING HALVES TOGETHER



FIG. 11. INSERTING THE GUIDES



FIG. 12. VARNISHING FINISHED CASES

off the "fuzz," then it is ready to be sized and starched. Since the sizing and starching machines are practically the same, only one will be shown and described.

In the machine shown in Fig. 13, the tape is fed into the machine at *A*, from where it passes between guide rolls, under a roll down in the solution with which it is soaked and up between squeezing rolls, and from them to the large drying reel at *B*.

The tank, carrying the sizing or starching solution and the rolls, is made to travel on ways parallel with the axis of the reel so as to wind the impregnated tape on the reel without overlapping. This feeding of the tank is done by means of a lead-screw *C*, which is driven by a belt *D* from the same shaft that turns the reel. From these reels the tape is run through a calendering machine, shown in Fig. 14, the steam-heated rolls of which smooth out the

tapes till they have a surface almost like glazed paper, which easily takes the subsequent printing. After being calen-

dered, the tape is stored in reels, as shown in Fig. 15, till it is taken to the printing or numbering department.

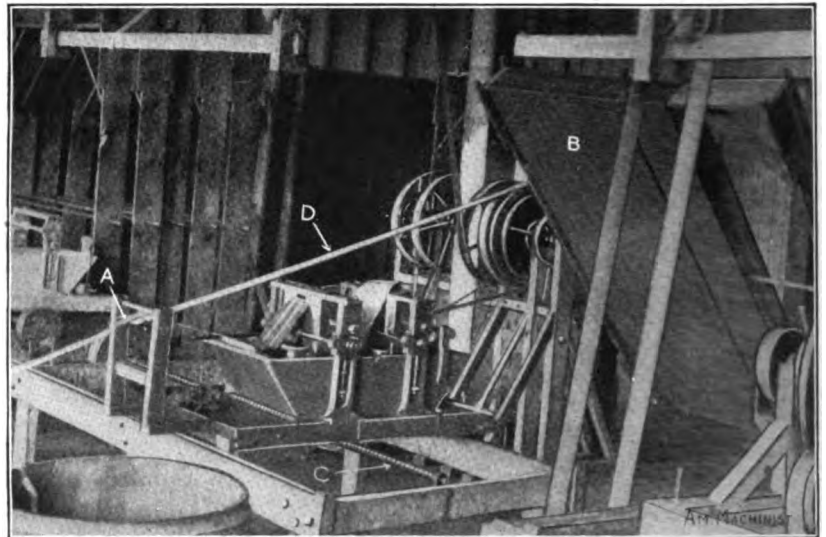


FIG. 13. TYPE OF MACHINE USED FOR SIZING AND STARCHING

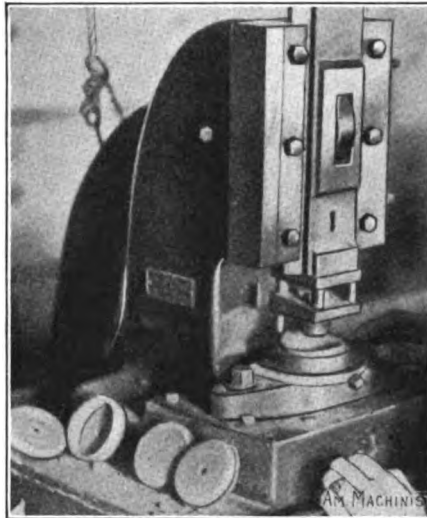


FIG. 5. PIERCING THE CENTER HOLE

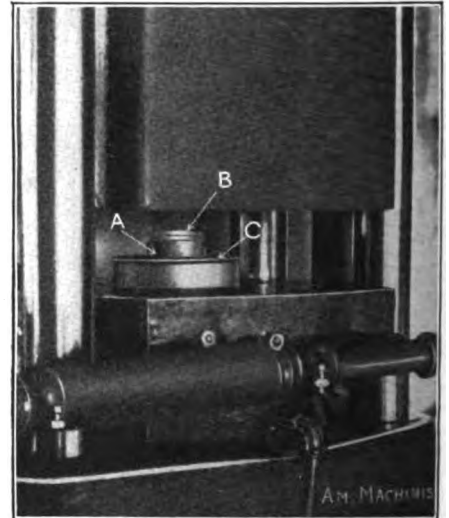


FIG. 6. EMBOSING THE CASES

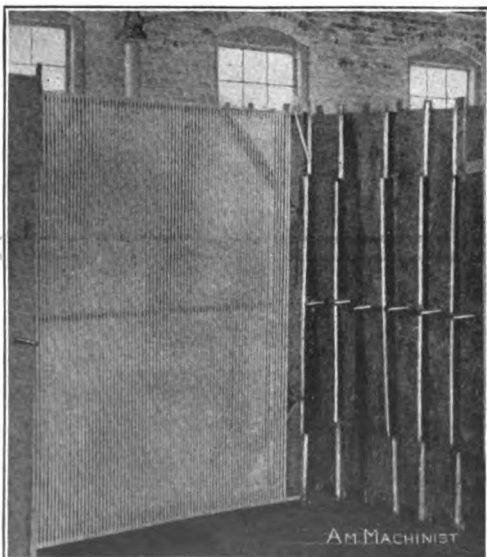


FIG. 15. REELS USED TO HOLD TAPE

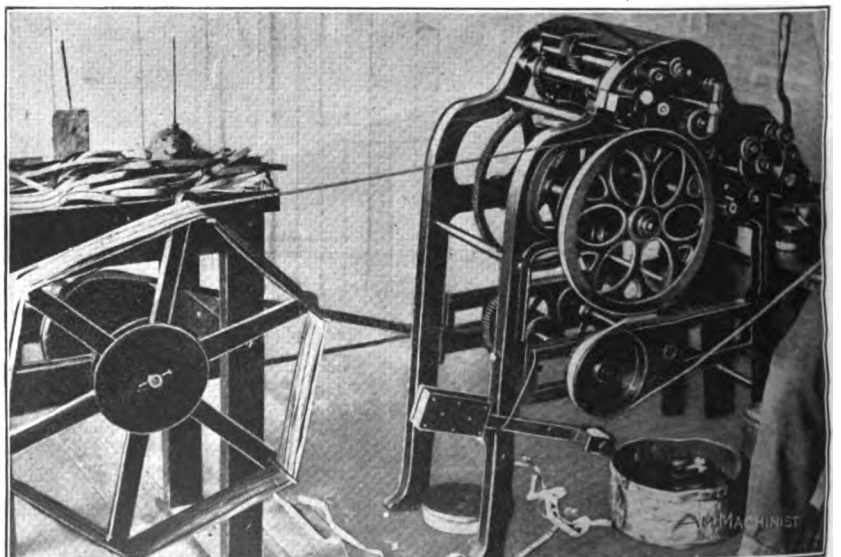


FIG. 16. AUTOMATIC TAPE-PRINTING MACHINE



FIG. 17. MACHINE FOR PRINTING WIDE TAPES

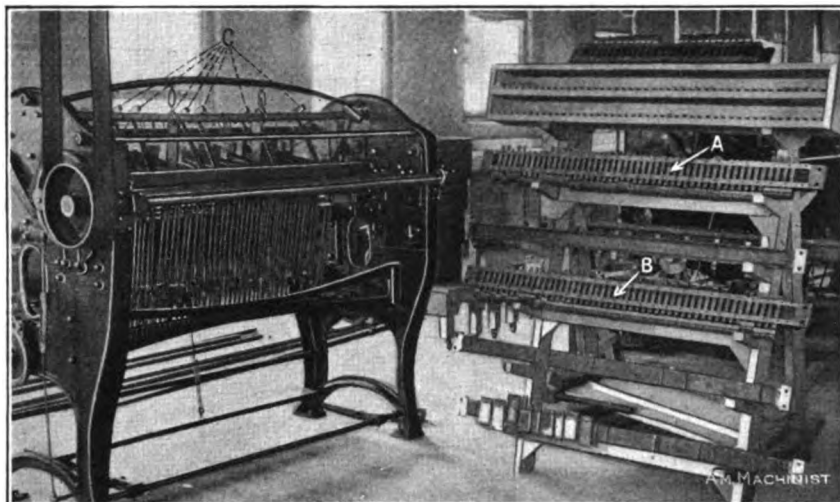


FIG. 18. WOOD-RULE NUMBERING AND DIVIDING MACHINE

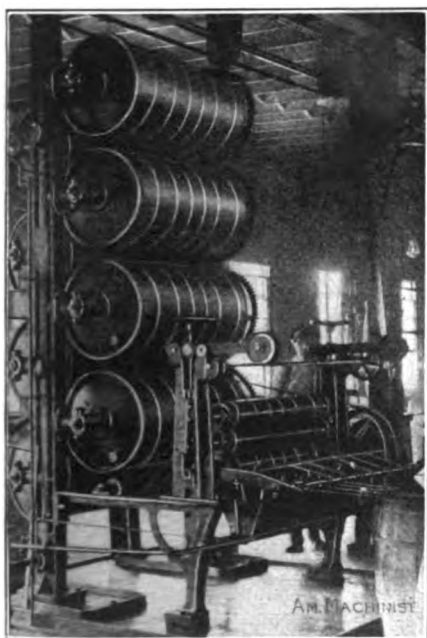


FIG. 14. TAPE-CALENDERING MACHINE

GRADUATING AND NUMBERING

The narrower widths of tape are divided and numbered in a small rotary printing press, as shown in Fig. 16. The division lines and inch figures are printed in black from the same wheel, but the foot figures are printed in red from a cam-operated wheel, which is indexed at each revolution of the other wheel. As the tape is printed it is wound on a belt-driven reel shown at the left.

The wide tapes, from $\frac{5}{8}$ in. up, are printed on a long printing bench, shown in Fig. 17, the figures being placed on blocks like A, hinged at B, which after the figures are inked, are swung over onto the tape which is laid in the channel at C. As shown, the printing blocks are guided onto the tape by small blocks placed on both sides of the tape channel.

The inking of the characters on the printing blocks is done with a roller D, held in the traveling carriage. Ink is applied to the roll at intervals with a putty knife E from a small box F. Rapid

and accurate work can be done with this printing bench on tapes too wide to be handled on the regular printing presses.

WOODEN RULES

The blanks for wooden rules are worked up in the wood shop in a way similar to that of any wood shop doing a good grade of work. The ordinary one-foot, bevel-edged rule is graduated and numbered in an ordinary printing press carrying a line of the required length and makeup, though a special holder is used to present the proper part of the rule to the type.

The longer boxwood rules of a better grade have the divisions and figures stamped in them in a special machine shown in rear view at the left in Fig. 18. The steel punches used for dividing and numbering are made up in sets, which are held in special holders long enough to hold the entire set. Two of these sets are shown at A and B.

When stamping a certain rule, the proper set of punches is placed in the machine over the rule to be stamped, and the punches are driven down by a single tap from a gang of cam-operated hammers, one of which strikes each punch. A few of these hammers, raised so as to be seen, are shown at C.

WOODEN SQUARES

Squares used for cloth measuring are made of two pieces of wood riveted to-

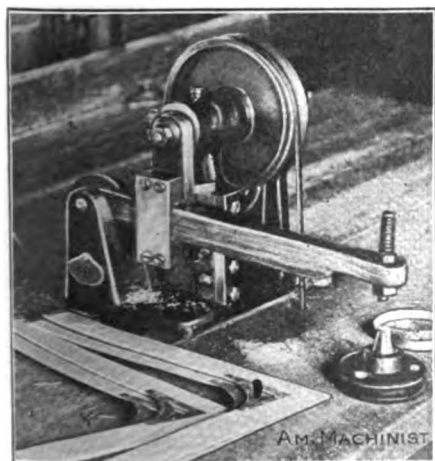


FIG. 20. SMALL RIVETER

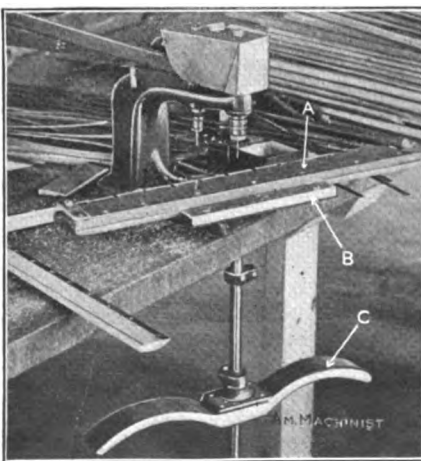


FIG. 21. RULE-DRILLING MACHINE AND JIG

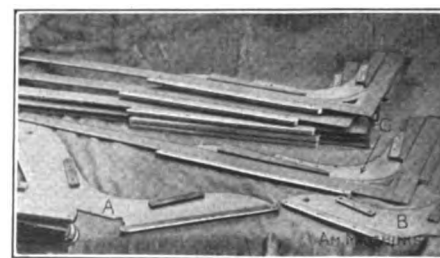


FIG. 19. CLOTH SQUARES AND JIGS

gether at the proper angle. The way the shaped pieces of wood are held in aluminum jigs while being drilled and pinned for the corner brace is shown in Fig. 19. Two of them, empty, are shown at *A* and *B*, and one with a square held in place by taper wedges is shown at *C*. The

yoke *C*, which rests across the knees of the operator.

LOG RULES

Log rules are made of the best grade of straight-grained hickory obtainable. They are thin bodied with one end large

the upper end, so that they may be dropped in between two iron bars which hold them over gas flames in a furnace just in front of the workman.

A machine for burning the numbers and divisions into long lumber rules is shown in Fig. 25. The numbers and di-



FIG. 22. LOG-RULE FINISHING

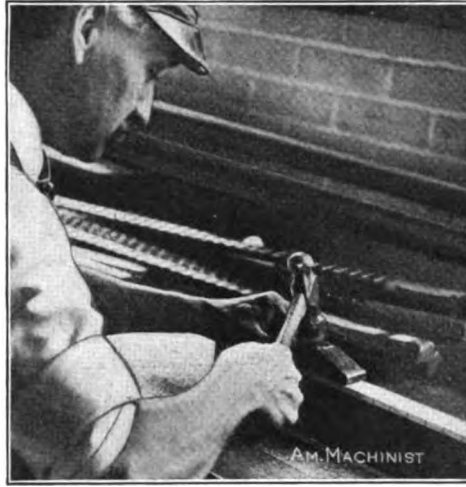


FIG. 23. DIVIDING LOG RULES



FIG. 24. BURNING IN THE FIGURES

corners of the jigs are cut away to allow for the drilling and pinning.

RIVETING AND DRILLING

These squares are riveted in the type of machine shown in Fig. 20, the construction of which is too plainly shown to need explanation.

The drilling of the squares and braces, as well as other rules, is done by girls in small drilling machines like that in Fig. 21. In the illustration the machine is shown fitted for drilling metal strips

for a handle and the other tipped with a metal *T*. They are first roughed out by hand and are then smoothed up on emery belts as shown in Fig. 22. A man holding one of the finished rules is shown in the background. Their flexibility is apparent.

The divisions are made in these log rules by means of a steel block having sharp ribs across its face. These ribs are driven into the wood by a sharp blow of a hammer, as shown in Fig. 23. One group is marked in and then the steel

vision lines are held in a long bed *A*, and are heated by gas flames underneath. The rule to be figured is pressed down onto the hot characters by means of the roller *B* held in the carriage *C*, which is fed rapidly along by the lead-screw *D*.

THE POLISHING ROOM

Throughout the factory the welfare of employees is closely guarded. Fig. 26 shows the exhaust system used to carry the dirt from the polishing and buffing wheels. The belts are also run from the

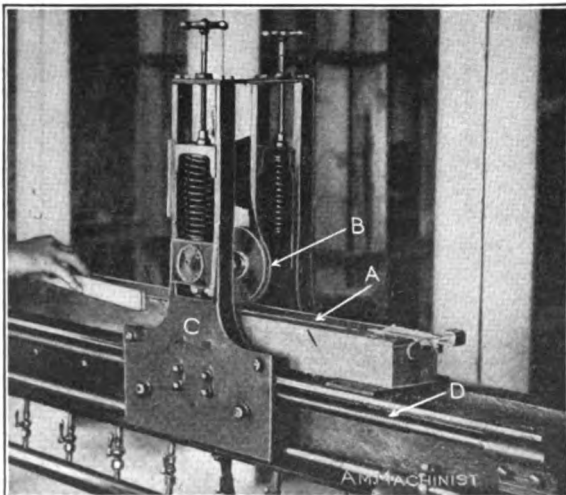


FIG. 25. NUMBERING AND DIVIDING LUMBER RULES

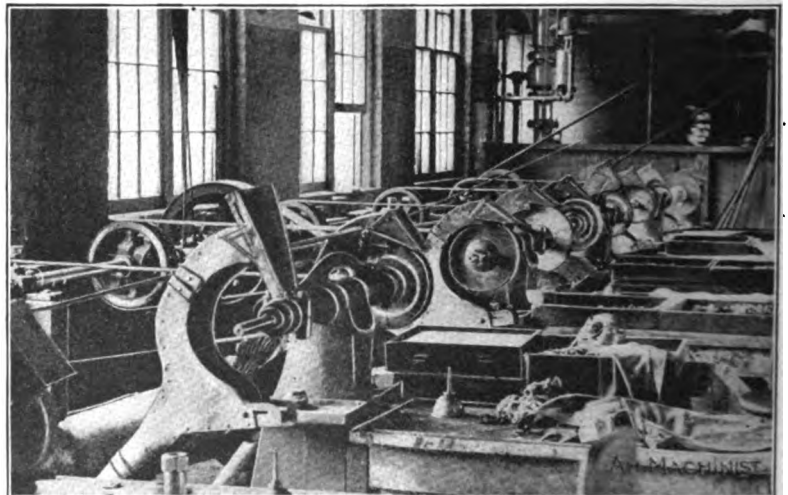


FIG. 26. POLISHING WHEELS AND EXHAUST HOODS

on bevel-edged rules, the rule being held in a jig *A*, which slides along under the drill, being guided by the strip *B*. Bushings are not used to guide the drill in this case, as approximate distances are sufficient, so only notches are used to guide the eye of the operator. The work is raised up to the drill by means of the

block is slid along, and using the last division as a gage for the end rib, the next group is stamped.

The divided rules are laid on a bench and the figures are burnt in by means of red-hot steel stamps as shown in Fig. 24. The stamps are held in the jaws of a pair of pliers and have a small crosspin near

back so that there is less chance of the men or the work getting caught in them, and also less overhead dust.

The factory force consists of a large number of both men and women, and the women go to work 30 minutes later and leave 15 minutes sooner in the evening. This plan gives the women a chance

to avoid the worst crowds on the street cars and in many ways is a splendid plan.

A self-serve lunchroom is provided in the factory, where employees may obtain coffee, tea, milk, soup, pies, sandwiches, meat, potatoes and many other things at a price barely sufficient to cover the actual cost of the food. The lunchroom, a part of which is shown in Fig. 27, has ample seating capacity for all those who wish to eat there, and the

in Fig. 28. This halftone also gives a partial view of about one-third of the factory buildings.

Squares of Improved Design

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The squares shown in the first two cuts are for die maker's use. The third is a knife-edge of improved, adjustable-blade

and looking through the hole, the high spots can be easily seen.

A tool maker's ordinary square with any number of narrow blades ground to any angle desired is shown in Fig. 2. For ordinary work a set consisting of blades 1, 1¼ and 1½ deg. will be found convenient. Two angles can be ground on one blade, one on each edge, but to prevent confusion one only is desirable.

An improved knife-edge square with a fine adjustment for setting the blade is shown in Fig. 3. The part of the blade which enters the stock is beveled on the inner edge to the same angle as the one

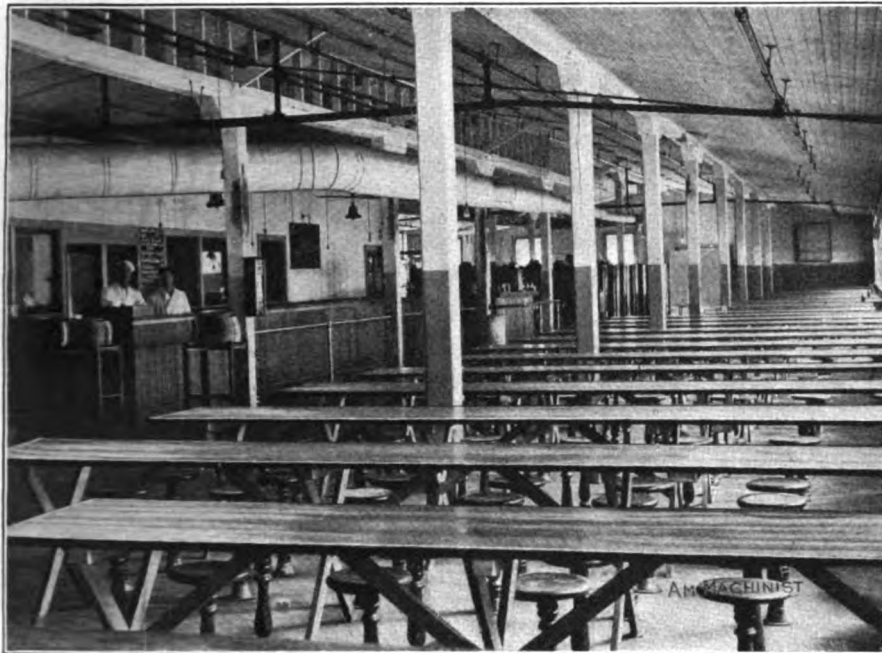


FIG. 27. THE LUNCHROOM

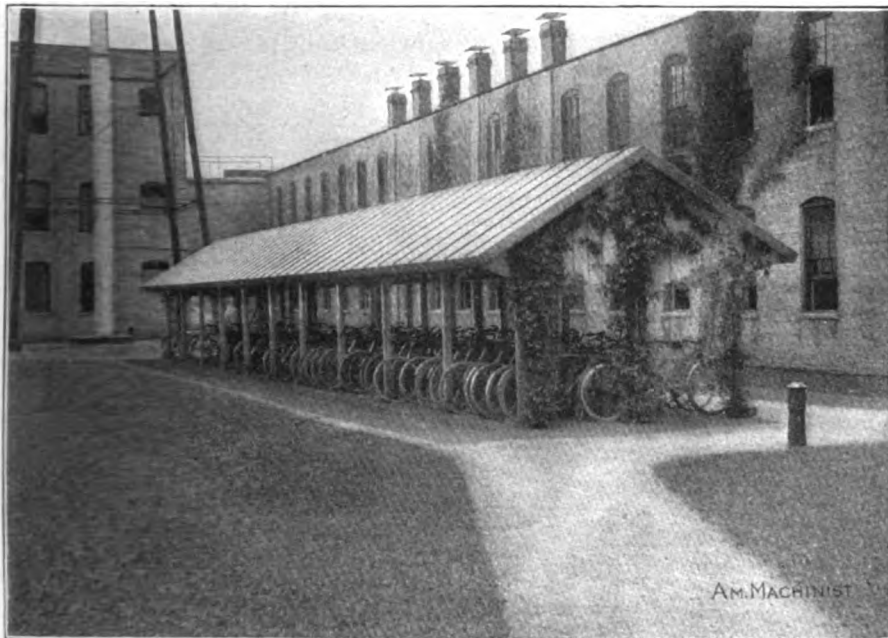


FIG. 28. BICYCLE STORAGE SHED

counter is so arranged that the employees may be served in the quickest possible time.

Many of the workmen ride to the factory on their bicycles, so a neat storage shed has been provided; this is shown

design with the fine adjustment essential for accurate setting.

The square, Fig. 1, has an adjustable blade and a ⅜-in. hole through the stock to sight the blade on the die to see where it bears. By holding the die to the light

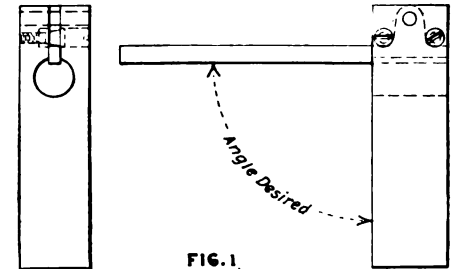


FIG. 1.

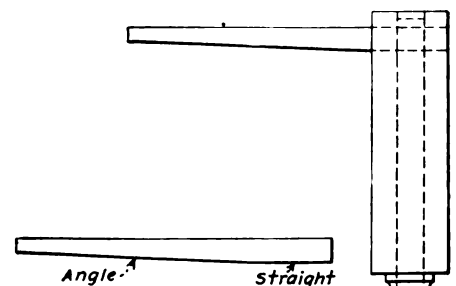


FIG. 2

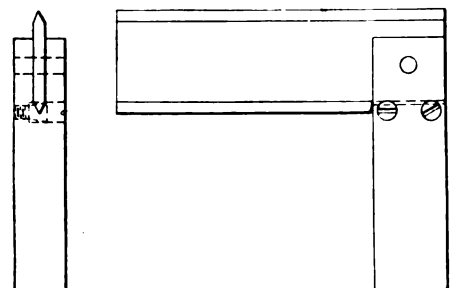


FIG. 3

IMPROVED SQUARES

on the screw and is adjusted by the two screws to bring the blade at right angles to the stock.

In 1909 the value of coal sold as such and of the coke produced at the mine amounted to \$577,142,935, of which anthracite contributed \$149,180,471 and bituminous \$27,962,464. Petroleum and natural gas came next with a product valued at \$185,416,684. Other industries contributing over \$10,000,000 worth of product, with the value of their products, were: Copper, \$134,616,987; iron, \$106,947,082; gold and silver, \$94,123,180; lead and zinc, \$31,363,094; limestone, \$29,832,492; granite, \$18,997,976; phosphate rock, \$10,781,192.